The Hitchhiker's Guide to Post-Heatwave Seed Germination: Don't Panic!

A thesis submitted to the University of Technology Sydney in completion of the degree of Master of Science (Research)

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I, Philippa Roslyn Alvarez, declare that this thesis, is submitted in fulfilment of the requirements for the award of Master of Science (Research), in the School of Life Sciences, Science at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Abstract

Human-induced climate change is the primary source of a global increase in temperature and extreme weather events such as heatwaves. Heatwaves are increasing in intensity and frequency causing detrimental changes to plant communities worldwide, with the temperate woodlands in south-eastern Australia as no exception. The frequency and intensity of heatwaves in the Cumberland Plain Woodland (CPW) are expected to increase, exposing seeds, the most vulnerable stage of the plant lifecycle, to new conditions. This could alter the composition and biodiversity of this threatened ecological community. In this thesis, I aim to understand the link between the physiological mechanisms behind seed germination and the ecological context of these species to understand the future plant community composition of the CPW region.

I first established the effect of experimental heatwaves on seed germination attributes in native plant species, with focus on intensity and and frequency. Each species' response to each treatment differed with no consistent pattern. A few species were driving the species x treatment interaction so, I considered the underlying mechanisms causing this interaction by studying the life-history traits of species. I found that life-history traits were related to the interspecific patterns of variation in all three germination attributes, with life form having the greatest influence over seed germination. Seed mass and dormancy also influenced germination attributes but to a lesser degree than life form, and fire response only partially influenced germination attributes.

Considering the findings outlined above, I focused on seed longevity of a small subset of species . I found that exposure to a single, experimental, post-fire heatwave had no

significant effect on seed longevity compared to a control group not exposed to heatwave conditions. However, the responses of species varied differently depending on the time exposed to heatwaves. I did find a species x time interaction. There was also a link between taxonomic group and germination attributes. Asteraceae were short-lived and Myrtaceae were long-lived, however, Fabaceae did not have the same kind of longevity, instead *A. decurrens* was short-lived and *H. violacea* was long-lived.

The work presented in this thesis provides information regarding: the effect of intense and frequent heatwaves on seed germination attributes, the role of life-history traits in contributing to seed germination attributes over and above the idiosyncratic levels found after a heatwave event, and the impact of a single intense heatwave on species' longevity, from native plant species found in the Cumberland Plain Woodland.